

Analysis of Cost Variation among Different Brands of Fluoroquinolones Available in Indian Market – A Pharmacoeconomic Study

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Received: 15-06-2022 / Revised: 18-07-2022 / Accepted: 20-08-2022

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Conflict of interest: Nil

Abstract

Background: Fluoroquinolones are one of the widely prescribed antibacterial agents in hospitals and community practices to treat infections all over the world. The lack of comparative information regarding cost variation among different brands of antibiotics puts the prescribers in a difficult state to choose the best medication and at the same time most cost-effective treatment regimen.

Aims and Objectives: The present study was done with the aim to evaluate the cost variation among the various brands of fluoroquinolones available in Indian market by calculating the percentage price variation.

Materials and Methods: CIMS (Current index of medical specialities) April to July 2022 edition was used to review the prices of different brands of oral and parenteral fluoroquinolones with same strength available in Indian market. Cost ratio and percentage price variation were calculated among different brands of fluoroquinolones.

Results: Maximum percentage price variation among oral fluoroquinolones of 2080.17 was found to be for levofloxacin 500mg which and the lowest percentage price variation of 66.67 was found to be for norfloxacin 200 mg. Maximum percentage price variation of 313.04 among parenteral fluoroquinolones was found to be for ofloxacin 200mg/100 ml and lowest of 59.89 was found to be for moxifloxacin 400 mg/100 ml.

Conclusion: The wide price variation between different brands of fluoroquinolones has been highlighted in our study. Physicians must consider socioeconomic background of patients should be considered while prescribing to reduce non-compliance and economical regimen for patients.

Keywords: Price variation, Fluoroquinolones, Brands, Pharmacoeconomics

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Introduction

The treatment of infectious diseases is one of the major healthcare problems in India [1,2].

More than 3000 pharmaceutical companies, 10,500 manufacturing units, and more than

60,000 generic brands across 60 therapeutic categories are present in Indian pharmaceutical market [3]. In India, expenses on medications are generally borne as out of pocket expenditure by patients. High treatment costs reduce patient compliance, raise morbidity and mortality, and may be a factor in the development of antibiotic resistance. It is well known that wide price variation among different brands of same drug exist in India [1]. Therefore, the prescriber's consideration of cost is a crucial factor, along with others, in a rational prescription, ensuring that the patient can afford the medication and manage his condition [4].

Quinolones are one of the widely prescribed antibacterial agents in hospitals and community practices to treat infections all over the world. Ciprofloxacin and levofloxacin together have a share of around 65% (\$3.3 billion) in global sales [1,4]. Fluoroquinolones are a class of synthetic antibiotics having broad-spectrum activity and potent bactericidal agents which are active against many gram positive and gram negative pathogens that cause a number of infections including urinary tract infections, respiratory tract infections (RTIs), gastrointestinal infections, sexually transmitted diseases (STDs), and skin infections [5].

The lack of comparative information regarding price variation among different brands of antibiotics puts the prescribers in a difficult state to choose the best medication and at the same time most cost-effective treatment regimen [6,7]. Information obtained

from pharmacoeconomic analysis studies will be helpful for both the physicians in choosing the cost-effective regimen for their patients and for policy makers in successfully utilizing the limited resources that are available [8].

Limited studies are available in Indian context which compares the price variation among different brands of fluoroquinolones.

So, in above context, the present study was done with the aim to evaluate the price variation among the various brands of fluoroquinolones available in Indian market by calculating the percentage price variation.

Methodology

The present study was done using latest CIMS (Current index of medical specialities) to review the prices of different brands of oral and parenteral fluoroquinolones with same strength available in Indian market. CIMS is available readily and is updated regularly. The cost was calculated in Indian Rupees per 10 tablets/capsules and 1 vial/ampoule or infusion bottle of same strength. Oral formulations in liquid form and combinations of the fluoroquinolones with other antibiotics and prebiotics were not included in this study.

Cost ratio among the different brands of the same drug manufactured by different pharmaceutical companies was calculated as follows:

$$\text{Cost ratio} = \frac{\text{Maximum cost (max cost)}}{\text{Minimum cost (min cost)}}$$

Percentage cost variation among the different brands of the same drug manufactured by different pharmaceutical companies was calculated as follows:

$$\text{Percentage cost variation} = \frac{\text{Maximum cost} - \text{Minimum cost} \times 100}{\text{Minimum cost}}$$

The data obtained from CIMS were entered in Microsoft excel. Cost ratio and percentage cost variation were calculated.

Results

Oral fluoroquinolones and their strength, number of brands, minimum cost, maximum cost, cost ratio and percentage price variation per 10 tablets are shown in Table 1. Maximum number of brands, among oral fluoroquinolones were found to be for levofloxacin 500 mg- 41 brands & ofloxacin 200 mg – 41 brands followed by 29 brands for ciprofloxacin 500 mg and 24 brands for levofloxacin 250 mg. Maximum cost ratio among oral fluoroquinolones of 21.80 was found to be for levofloxacin 500 mg followed by 10.48 for ciprofloxacin 250 mg and 9.52 for ofloxacin 400 mg. The lowest cost ratio among oral fluoroquinolones of 1.67 was found to be for norfloxacin 200 mg and balofloxacin 100 mg. Maximum percentage price variation among oral fluoroquinolones of 2080.17 was found to be for levofloxacin 500 mg which is one of the most widely prescribed fluoroquinolones. Lowest percentage price variation of 66.67 was found to be for norfloxacin 200 mg.

Parenteral fluoroquinolones with their strength, number of brands, minimum cost, maximum cost, cost ratio, and percentage price variation are shown in Table 2. Maximum number of brands, among parenteral fluoroquinolones were found to be for ofloxacin 200mg/ 100ml- 10 brands followed by levofloxacin 500mg/ 100ml- 6 brands. Maximum cost ratio of 4.13 among parenteral fluoroquinolones was found to be for ofloxacin 200mg/ 100ml and lowest of 1.59 was for moxifloxacin 400mg/100 ml. Maximum percentage price variation of 313.04 among parenteral fluoroquinolones was found to be for ofloxacin 200mg/100 ml and lowest of 59.89 was found to be for moxifloxacin 400 mg/100 ml.

Discussion

In the present study a noticeable percentage price variation among different brands of fluoroquinolones was found. Percentage price variation among various brands of fluoroquinolones with same strength was

found to be ranging from 59.89% to 2080.17%. In some previous studies by Chawan *et al* [2] and Dhanvijay *et al* [4], similar price variation was found.

In developing countries like India, the wide percentage price variations put an unnecessary economic burden over the population [4]. The major reason of the high cost of medications is prescribing drugs by their brand names [9]. The lack of comparative information on drug cost and quality makes it difficult for physicians to prescribe the most economical treatment for their patients. In a meta-analysis by Allen *et al.*, ignorance about the cost of the drugs among doctors was highlighted, which also found that the doctors acknowledge that awareness of price information will improve their prescribing pattern [10].

Higher costs of medicines lead to nonadherence of treatment regimen [11]. Compliance to treatment regimen can be improved by decreasing costly treatment strategy and switching to cost-effective therapy [12,13]. Drug price control order (DPCO) is an order issued by the government to fix prices of medications. Medicine which are brought under DPCO, cannot be sold at higher cost than that fixed by the government [9]. It is now need of moment to provide physicians with regular information and updates on cost-effective treatments/drugs [13]. Pharmacoeconomic considerations when prescribing antibiotics to patients for the treatment of infections can help reduce non-compliance, treatment failure, and antibiotic resistance [6,12]. Therefore, there is an urgent need for robust mechanisms to control price volatility across brands and regulate the cost of branded drugs. Incorporating prescribing cost analysis into medical curricula and providing comparative pricing manuals with prescribing advice for physicians can reduce patient drug spending [9,14,15].

Continuous systematic cost review of different brands of medicines available in the

market by the hospital professionals and concerned authorities before including them in hospital formulary can provide economical regimens for patients [6]. Further research is needed to investigate the reasons behind price differences between different brands of drugs and options to overcome this disparity.

The limitation of this study was that only CIMS was used as resource to calculate the price variation, but there is possibility of presence of other brands of fluoroquinolones in Indian market, which were not mentioned in CIMS.

Conclusion

The wide price variation between different brands of fluoroquinolones has been highlighted in our study. Cost effective regimen plays a significant role in treatment adherence. Physicians must consider socioeconomic background of patients should be considered while prescribing to reduce non-compliance and economical regimen for patients. As far as possible, physicians must prefer generic names while prescribing.

Table 1: Variation in cost of oral fluoroquinolones

| Drug | Strength/Dose (Tablet/Capsule) | Number of brands | Min Cost | Max Cost | Cost ratio | Percentage price variation |
|---------------|--------------------------------|------------------|----------|----------|------------|----------------------------|
| Ciprofloxacin | 100 mg | 04 | 12.75 | 25.20 | 1.98 | 97.65 |
| | 250 mg | 21 | 12.50 | 131.05 | 10.48 | 948.4 |
| | 500 mg | 29 | 16.87 | 67 | 3.97 | 297.15 |
| | 750 mg | 04 | 59.51 | 308.65 | 5.186 | 418.65 |
| | 1000 mg | 03 | 85.06 | 186 | 2.18 | 118.66 |
| Gemifloxacin | 320 mg | 06 | 178 | 580 | 3.25 | 225.84 |
| Levofloxacin | 250 mg | 24 | 40 | 75 | 1.87 | 87.5 |
| | 500 mg | 41 | 45 | 981.08 | 21.80 | 2080.17 |
| | 750 mg | 22 | 76 | 134.14 | 1.76 | 76.5 |
| Lomefloxacin | 400 mg | 03 | 97.5 | 185 | 1.89 | 89.74 |
| Moxifloxacin | 400 mg | 13 | 196.9 | 729.56 | 3.70 | 270.52 |
| Norfloxacin | 200 mg | 02 | 23.40 | 39 | 1.67 | 66.67 |
| | 400 mg | 05 | 20.67 | 68 | 3.29 | 228.98 |
| Ofloxacin | 100 mg | 10 | 20 | 50.6 | 2.53 | 153 |
| | 200 mg | 41 | 30 | 80.52 | 2.68 | 168.4 |
| | 400 mg | 20 | 62.4 | 594.28 | 9.52 | 852.37 |
| Pefloxacin | 400 mg | 02 | 24.06 | 49.50 | 2.05 | 105.73 |
| Sparfloxacin | 100 mg | 04 | 28.76 | 60.3 | 2.09 | 109.67 |
| | 200 mg | 15 | 59.16 | 137.86 | 2.33 | 133.03 |
| Balofloxacin | 100 mg | 02 | 83.50 | 140 | 1.67 | 67.66 |

Table 2: Variation in cost of parenteral fluoroquinolones

| Drug | Strength/Dose 1 vial/ infusion bottle | Number of brands | Min Cost | Max Cost | Cost ratio | Percentage price variation |
|---------------|---------------------------------------|------------------|----------|----------|------------|----------------------------|
| Ciprofloxacin | 200 mg/100 ml | 05 | 16.25 | 54.20 | 3.34 | 233.53 |
| Levofloxacin | 500 mg/100 ml | 06 | 93.33 | 277 | 2.96 | 196.79 |
| Moxifloxacin | 400 mg/100 ml | 04 | 210 | 335.77 | 1.59 | 59.89 |
| Ofloxacin | 200 mg/100 ml | 10 | 42 | 173.48 | 4.13 | 313.04 |

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